

October 8, 2019

Permit Supervisor
Utah Coal Regulatory program
Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, UT 84114-5801

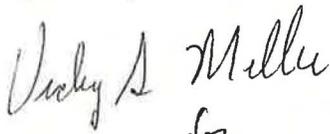
Re: Clean Copies of Amendment for Removal of Water Monitoring Sites, Task ID# 5984 Canyon Fuel Company, LLC, Dugout Canyon Mine, C/007/039

Dear Sirs:

Please find enclosed with this letter clean copies of an amendment to discontinue the monitoring of sites outside the area of influence of mining at the Dugout Canyon Mine. A description of the information for each monitoring site is provided in the amendment and appendix attached.

If you have questions or need addition information, please contact Vicky Miller at (435)286-4481.

CANYON FUEL COMPANY
Dugout Canyon Mine


for

Robert Marshall
Technical Services Manager

Encl.

cc: DOGM Correspondence File

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APPLICATION FOR COAL PERMIT PROCESSING

Permit Change New Permit Renewal Exploration Bond Release Transfer

Permittee: Canyon Fuel Company, LLC

Mine: Dugout Canyon Mine

Permit Number: C/007/039

Title: Clean Copies of Revision to M&RP to Remove Water Monitoring Sites, Task ID# 5984

Description, Include reason for application and timing required to implement:

Instructions: If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

- Yes No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ increase decrease.
- Yes No 2. Is the application submitted as a result of a Division Order? DO# _____
- Yes No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
- Yes No 4. Does the application include operations in hydrologic basins other than as currently approved?
- Yes No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
- Yes No 6. Does the application require or include public notice publication?
- Yes No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
- Yes No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
- Yes No 9. Is the application submitted as a result of a Violation? NOV # _____
- Yes No 10. Is the application submitted as a result of other laws or regulations or policies?

Explain: _____

- Yes No 11. Does the application affect the surface landowner or change the post mining land use?
- Yes No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
- Yes No 13. Does the application require or include collection and reporting of any baseline information?
- Yes No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
- Yes No 15. Does the application require or include soil removal, storage or placement?
- Yes No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
- Yes No 17. Does the application require or include construction, modification, or removal of surface facilities?
- Yes No 18. Does the application require or include water monitoring, sediment or drainage control measures?
- Yes No 19. Does the application require or include certified designs, maps or calculation?
- Yes No 20. Does the application require or include subsidence control or monitoring?
- Yes No 21. Have reclamation costs for bonding been provided?
- Yes No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
- Yes No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

Please attach one (1) review copy of the application.

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

Robert Jay Marshall
Print Name

R. Jay Marshall EGR MGR 10/17/19
Sign Name, Position, Date

Subscribed and sworn to before me this 2 day of October, 2019

Josephine Archuleta
Notary Public

My commission Expires: 9.21.2021
Attest: State of Utah } ss:
County of Carbon



<p>For Office Use Only:</p>	<p>Assigned Tracking Number:</p>	<p>Received by Oil, Gas & Mining</p> <p style="color: blue; font-weight: bold; font-size: 1.2em;">RECEIVED</p> <p style="color: red; font-weight: bold; font-size: 1.2em;">OCT 11 2019</p> <p style="color: blue; font-weight: bold;">DIV OF OIL, GAS & MINING</p>
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CHAPTER 7
HYDROLOGY

M&RP

- 7-7 Undisturbed Watersheds Adjacent to Surface Facilities
- 7-8 Disturbed Area Watershed Boundaries
- 7-9 Dugout Creek Reclamation Details

LIST OF APPENDICES

Appendix

- 7-1 Water Rights Data
- 7-2 Groundwater Monitoring Data
- 7-3 Mayo and Associates Report
- 7-4 Monitoring Well Water-Level Data and Well Logs
- 7-5 USGS Streamflow and Water-Quality Data for Dugout Creek
- 7-6 UPDES Permit Applications
- 7-7 Surface-Water Monitoring Data
- 7-8 Sedimentation Pond Design Calculations
- 7-9 Diversion and Culvert Design Calculations
- 7-10 Hydrologic Design Methods
- 7-11 Reclamation Hydrology Calculations
- 7-12 Pace Canyon Fan Portal Site
- 7-13 Hydrographs
- 7-14 Water Monitoring Site Reduction

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<u>Spring</u>	<u>Formation</u>
SC-65	Colton
SP-20	Flagstaff
SC-14	North Horn
SC-100	Flagstaff (at North Horn FM. Contact)
SC-116	North Horn
200	North Horn
203	North Horn
227	Castlegate Sandstone
259	North Horn
260	Colton
259A	Colton
321	Colton
322	Colton - Operational quarterly flow measurements only
324	Colton - Monitoring begins 3 rd Quarter 2008

Locations of these springs are noted on Plate 7-1.

With the addition of 240 acres associated with Federal Coal Lease U-07064-027821, groundwater monitoring location 324 associated with existing water rights identified by an authorized representative of the Conover Trust was added in the third quarter of 2008. Site 324 lies outside the area under lease for mining, thus excluding the influence by mining operations. Following 10 years of monitoring and after the 3rd quarter of 2019, site 324 will cease to be monitored.

The purpose of monitoring the above-listed springs will be to assess potential impacts to groundwater systems overlying the Blackhawk Formation due to subsidence and mine dewatering. Springs have been selected for monitoring in the Colton, Flagstaff, North Horn, and Castlegate Sandstone Formations. These springs are reasonably accessible and, based on the historical data, are representative of conditions within their respective formations.

The monitoring of springs 322, 200, 227 and 259 was discontinued after the sampling in the 1st quarter of 2012. Springs 227 and 259 have been mined beneath and subsided and therefore will not be reinstated for monitoring.

- Spring 322 is located outside of the current permit and lease boundary and will not be mined near or beneath, thus being outside the influence of mining. Spring 322 was incorporated into the monitoring program in 2008 to provide a monitoring location **outside** the area of influence to establish a baseline. In 2010 the northernmost panel within the permit boundary was sealed and mining moved to the south approximately three miles.
- Spring 200 has been monitored since 1999. Between 1999 and 2011, the spring has had flow 6 times in 13 years, 1999 had three flows, 2000 had one flow, 2001 had one flow and 2004 had one flow. There has been no flow at Spring 200 since May 2004. No mining has or is planned to occur near or beneath Spring 200.

- Spring 227 has been monitored since 1999. Between 1999 and 2011, the spring has had flow twice in 13 years, once in 2004 and once in the second quarter of 2011. Mining occurred beneath Spring 227 in 2006, the mined panel was sealing in 2006/2007. Subsidence information for the area is located in the annual reports for the corresponding years.
- Spring 259 has been monitored since 1999. Between 1999 and 2011, the spring has flowed 8 times in 13 years, four times in 1999, twice in 2000 and twice in 2001. Spring 259 has been dry since the samples in 2001. Mining occurred beneath Spring 259 in 2007, the mined panel was sealing in 2007/2008. Subsidence information for the area is located in the annual reports for the corresponding years.
- Spring 321, 324 and 259A are located outside of the current permit and lease boundary and will not be mined near or beneath, thus being outside the influence of mining. Spring 321 was incorporated into the monitoring program in 2007, Spring 324 in 2008, Spring 259A in 2007 to provide monitoring locations outside the area of influence to establish a baseline. The discharge from 321 runs for a short distance and disappears. The flow from Spring 259A is collected and directed through a pipeline to a stock tank.
- Spring 203 is an improved spring located in Pace Canyon. The spring was not mined near or beneath, thus being outside the influence of subsidence from mining. The monitoring of Spring 203 began in 2000 (baseline sample 1999), with the average spring flow being 3.5 gpm during the 18 year period. In 2002 monitoring included 24 samples with the flow ranged from 2.5 to 6.6 gpm.
- Spring SC-116 has been monitored since 1995. Between 1995 and 2018, the spring's flow has averaged 2 gpm. Coal was extracted beneath the spring in the Gil 7 panel from July 2008 thru March 2009. The flow during 2008 through 2009 averaged 3.4 gpm and in 2010 and 2011 the average flow was 4.8, exhibiting no impact for the mining. Considering the length of time since mining was completed subsidence has ceased, as demonstrated in the subsidence information submitted in the mine's annual reports.
- Spring SC-65 and SC-100 are located outside of the current permit and lease boundary, with no mining being done near or beneath the springs. Spring SC-65 was monitored once in 1995 and 1996 then began being quarterly monitoring in 1997. The flow for the over 80 samples at SC-65 averaged 4.3 gpm. Monitoring of SC-100 began in 1995, of the approximate 100 site visits the spring has been dry or not accessible 75% of the time. When the spring did flow it averaged 1.14 gpm.
- Spring 260 has consistently flowed during site visits for sampling. The sampling began in 2000 and has continued for approximately 20 years, with the average flow being 12.23 gpm during that time frame. No mining has occurred beneath this spring.
- The monitoring of springs 260, 259A, 324, 321, 203, SC-65, SC-116 and SC100 were discontinued following their sampling in the 3rd quarter of 2019. Graphs showing the flow (approximately last 10 years) and additional information concerning these monitoring sites is provided in Appendix 7-14.

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It should be noted that reliable data have been difficult to collect from the limited number of springs issuing from the Blackhawk Formation within the permit and adjacent areas. As a result, no springs issuing from this formation have been included in the long-term monitoring program.

The ground water monitoring and sampling protocols to be implemented are described in Table 7-4. These protocols are based on the probable hydrologic consequences (PHC) of mining as presented in Section 728 and Appendix 7-3 of this M&RP and the requirements put forth in the Division's regulations. Table 7-4 is the same as that presented in Coal Regulatory Program Directive Tech-004, with the exception that total hardness and total alkalinity are not included. Total hardness, which is primarily of concern in water supplies being developed for domestic use, was not added to the list because summer-home development of the permit area is not an identified post-mining land use. Total alkalinity was not added to the list because the baseline data indicate that acid-generating materials, which may affect the alkalinity of the water, are not present within the permit and adjacent areas.

The protocols set forth in Table 7-4 will be followed during years of normal precipitation as defined in the PHC. Wet or dry (not normal) years for the mine area are defined based on the Natural Resources Conservation Services snow-pack measurements as of March 1 for the Price River-San Rafael River Basin. A wet year occurs when the snow pack water content is greater than 110% of normal and a dry year when the snow pack is less than 70% of normal. After the permit is issued, the following monitoring protocol will be implemented for the first wet or dry year occurrence:

1. Weekly measurements of flow during the first wet year and the first dry year following permit issuance will be obtained. The purpose of these measurements will be to prepare base-flow hydrographs of the monitored springs. Flow measurements during the first wet year and the first dry year will be collected weekly between April 1 and August 31 as conditions permit.
2. Water samples will be obtained during high- and low-flow season in conjunction with the quarterly sampling, if applicable. The samples will be analyzed in accordance with Table 7-4 with the addition of tritium analysis.

In addition to the above regular monitoring, one water sample will be collected at each spring sampling point during low flow period every fifth year, during the year preceding re-permitting, to be analyzed for baseline parameters (Table 7-4).

Weekly measurements taken of the flow during 2011 represent the first wet year following the issuance of the permit. The first dry year weekly flow measurements were taken in 2002. Base-flow hydrographs comparing the wet and dry year measurements have been included as Appendix 7-13.

Water samples were obtained during high- and low-flow season in conjunction with the quarterly sampling during the wet year (2011) and the dry year (2002). The samples were analyzed in

accordance with Table 7-4 with the addition of tritium analysis. These analyses were incorporated into the UDOGM data base for 2002 and will be incorporated for the wet year (2011).

Groundwater was discovered discharging from old Gilson coal seam workings located on the east side of Dugout Canyon during construction of the Dugout Canyon Mine in September 1998. Prior to construction, this water seeped unnoticed through unconsolidated fill and into Dugout Creek. The water discharging from these old workings will be monitored on a quarterly basis for the parameters listed in Table 7-4 beginning in the fourth quarter of 1998. The monitoring point is labeled MD-1 on Plate 7-1.

Data will be collected from the Dugout Canyon Mine and Pace Canyon Fan Portal mine-water discharge point in accordance with the UPDES permits. No water will be discharged prior to obtaining the necessary UPDES permits. The monitoring requirements proposed herein, including the analytical parameters and the sampling frequency, may be modified in the future in consultation with the Division if the data demonstrate that such a modification is justified.

Data from the actively monitored locations will be collected under the groundwater monitoring program every year following the completion of surface reclamation activities. During the post-mining period, water levels will be collected from the monitoring wells and data/samples will be collected from the identified springs once each year during September or October (i.e., the low-flow season while the sites are still accessible). Groundwater monitoring during the post-mining period will continue until bond release.

All groundwater monitoring data will be submitted to the Division by the end of the quarter following sampling. If analyses of any groundwater sample indicates noncompliance with the permit conditions, the permittee will promptly notify the Division and take immediate appropriate actions. UPDES reporting requirements will be met for the mine-water discharge points. The Snotel data used to determine "wet" or "dry" years, as described previously in this section, will be submitted with the first quarter water monitoring data beginning in the year 2001 or in the annual report.

Equipment, structures and other devices used in conjunction with monitoring the quality and quantity of groundwater in the permit and adjacent areas have been or will be installed, maintained, and operated in accordance with accepted procedures. Where feasible, this equipment will be removed or properly abandoned by the permittee when no longer needed.

Surface Water Monitoring. Surface water monitoring to be conducted in the permit and adjacent areas will consist of data collection from streams and sedimentation pond discharges. Locations of streams to be monitored are noted on Plate 7-1. The surface water monitoring plans presented herein were developed based on information presented in the PHC determination, the baseline hydrologic data, and the geologic data presented in Chapter 6 of this M&RP.

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Station DC-1 will be monitored to evaluate surface-water conditions downstream from the proposed surface facilities. Stations DC-2 and DC-3 will provide data concerning background surface-water conditions immediately upstream from the proposed surface facilities. Stations DC-4 and DC-5 will be located at the Castlegate Sandstone-Blackhawk Formation contact and will provide data that will be used to determine the relationship between the Blackhawk Formation and the base flow of Dugout Creek.

PC-1a and PC-2 are located on Pace Creek and will be monitored to evaluate surface-water conditions up gradient and down gradient, respectively, of the permit area. Monitoring point (Fan) has been added on Pace Creek at a location approximately 600 feet upstream from the top of the Pace Canyon Fan facilities disturbed area boundary. Monitoring locations Fan and PC-2 will be monitored to evaluate surface water conditions up gradient and down gradient, respectively, of the Pace Canyon Fan facilities. RC-1 has also been established as monitoring point to obtain baseline data for future mine expansion. Baseline data was obtained from the aforementioned three sites (PC-1a, PC-2 and RC-1) for three years prior to initiating operational sampling.

PC-3 is located on Pace Creek below the confluence of an unnamed ephemeral drainage with Pace Creek (Plate 7-1). Degas Wells G-18, G-19 and the AMV road are located adjacent to the unnamed drainage at various elevations. Surface water monitoring location PC-3 was added during the permitting of the AMV road and Degas Wells G-18 and G-31, baseline data was not gathered for this monitoring location. The operational monitoring of PC-3 will begin the 4th quarter of 2007.

PC-1A and PC-2 since June 1999, which are included in the Division's water database and in the updated spreadsheets found in Appendix 7-7, supports this determination. Flows in spring/early summer are typically several times greater than in late summer/fall. Also, it is interesting to note that in 2002 and 2003 there have been periods when there is no flow at station PC-2 and flows measured in late summer/fall at PC-1A have been significantly less than in previous years. The drop in flow is undoubtedly related to the prolonged drought the area has been suffering through since 1999.

Flow data from monitoring site RC-1 near the mouth of Rock Canyon indicates the lower sections of Rock Creek generally flow in response to spring runoff and after summer precipitation events. In 2002 and 2003, flow measured at RC-1 occurred only after a significant precipitation event. Again, the lack of flow in this creek is most likely related to the drought conditions that appear to have begun in the area in 1999.

RC-1 has also been established as monitoring point to obtain baseline data for future mine expansion. Baseline data was obtained from the aforementioned three sites (PC-1a, PC-2 and RC-1) for three years prior to initiating operational sampling.

Protocols for surface-water monitoring within the permit and adjacent areas are:

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- DC-1, FAN, PC-3 - Quarterly data collection in accordance with Table 7-5 (operational parameters). This table is the same as that presented in Coal Regulatory Program Directive Tech-004, with the exception that total hardness and total alkalinity are not included. As explained above, total hardness, which is primarily of concern in water supplies being developed for domestic use, was not added to the list because summer-home development of the permit area is not an identified post-mining land use. Total alkalinity was not added to the list because the baseline data indicate that acid-generating materials, which may affect the alkalinity of the water, are not present within the permit and adjacent areas.
- DC-2, DC-3, PC-1a, PC-2, and RC-1 - Quarterly data collection in accordance with Table 7-5. Collection of gain-loss hydrograph data during the first wet year and the first dry year following permit issuance. Wet and dry years will be defined as noted in the previous groundwater monitoring discussion. The hydrograph will be generated by collecting flow measurements during the first wet year and the first dry year on a weekly basis between April 1 and August 31 as conditions permit. Refer to Appendix 7-13 for hydrographs.

The monitoring of PC-1a and RC-1 was discontinued after the third quarter of 2019. PC1-a and RC-1 sampling locations are remote and outside the area for impacts by mining operations. Additional information concerning these monitoring sites is provided in Appendix 7-14.

- DC-4 and DC-5 - Collection of gain-loss hydrograph data during the first wet year and the first dry year following permit issuance, as described above. Collect flow measurements during the first wet year and the first dry year on a weekly basis between April 1 and August 31 as conditions permit. Samples will also be collected for laboratory analyses during the first wet year and the first dry year following permit issuance. Wet and dry years will be defined as noted above. These samples will be collected during the high-flow and low-flow seasons. The samples will be analyzed for tritium and the operational parameters contained in Table 7-5. Refer to Appendix 7-13 for hydrographs.
- 323 - Quarterly data collection in accordance with Table 7-5. Monitoring site 323 was incorporated into the monitoring program in 2008 to provide a monitoring location **outside** the area of influence to establish a baseline. Mining never occurred near or beneath the site. In 2010 the northernmost panel within the permit boundary was sealed and mining moved to the south approximately three miles. Sampling of site 323 was discontinued following the 1st quarter of 2012 sampling.

In addition to the above regular monitoring, one water sample will be collected at each sampling point during low flow period every fifth year, during the year preceding re-permitting, to be analyzed for baseline parameters (Table 7-5).

The monitoring requirements proposed herein, including the analytical parameters and the sampling frequency, may be modified in the future in consultation with the Division if the data demonstrate that

such a modification is justified. Data will be collected from the sedimentation pond discharge point in accordance with the UPDES permit. Data will be collected under the surface water monitoring program every year until bond release.

All surface water monitoring data will be submitted to the Division by the end of the quarter following sampling. If analyses of any surface water sample indicates noncompliance with the permit conditions, SCM will promptly notify the Division and take immediate appropriate actions. UPDES reporting requirements will be met for the sedimentation pond discharge point.

Equipment, structures and other devices used in conjunction with monitoring the quality and quantity of surface water in the permit and adjacent areas have been or will be installed, maintained, and operated in accordance with accepted procedures. Where feasible, this equipment will be removed or properly abandoned by SCM when no longer needed.

Monitoring and Mitigation Plan Pace Creek

Dugout Canyon Mine plans to leave a barrier under the majority of Pace Creek within the permit boundary. The stretches of Pace Creek (10/04 mine map) which are planned for undermining are above entry development, not longwall panels. There is approximately 1000 feet of stream channel having over 500 feet of cover planned for mining in 2007, 400 feet has approximately 900 feet of cover planned for mining in 2008 and approximately 100 feet has 1250 feet of cover planned for mining in 2008-2009. A surface water monitoring and mitigation program will be initiated in this area prior to potential subsidence occurring. This monitoring program will include conducting a pre-mining subsidence photographic survey of the stream channel from surface water monitoring location PC1A to where Pace Creek leaves the SW1/4SW14 Section 20, T13S, R13E and a single reference site below the Pace Canyon fan site. The purpose of the photographs will be to provide a visual record of the stream channel prior to mining disturbance. Five reference sites will be identified within the photographed portion of Pace Creek where the monitoring of surface ground water flows, channel width and general geomorphology will occur. These reference sites will be established during low flow in the creek and monitored as outlined by the USDA Forest Service (Stream Channel Reference Sites: An Illustrated Guide to Field Technique. General Technical Report RM-245, Harrelson et. Al., 1994). The photographing of Pace Creek and the selection of monitoring sites will be done no later than the Spring of 2006 and submitted as part of the 2006 annual report.

The surface water flows and channel width at these stations will be monitored on a monthly basis, when accessible, while mining is occurring within the 15 degree angle-of-draw of the stream channel. The Division will be notified if the area is inaccessible due to road or climatic conditions and the monitoring could not be accomplished. Once mining has been completed within the angle-of draw, the sites will be monitored annually for up two years following undermining. A report on the subsidence related impacts, if any, to the surface water flows, will be provided monthly to the Division during monthly monitoring and annually during annual monitoring.

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Mitigation will implement the Best Technology Currently Available in association with the repair of damage to the Pace Creek stream channel. The repairs may include the use of bentonite/soil mixes to fill persistent cracks that appear to be diverting water. Bentonite may also be used to line portions of the creek floor where leakage appears to be occurring. Other methods or chemicals, if environmentally safe and available, may be employed if bentonite and/or bentonite/soil mixes are ineffectual.

731.300 Acid- and Toxic-Forming Materials

Analyses presented in Chapter 6 of this M&RP indicate that acid- and toxic-forming materials are not present within the permit area. Parameters defining acid- and toxic-forming materials will periodically be monitored as described in Chapter 6 of this M&RP. In the event that acid- or toxic-forming materials are identified, they will be disposed of in appropriate waste-rock disposal facilities as described in Chapter 5 of this M&RP.

731.400 Transfer of Wells

Before final release of bond, exploration or monitoring wells will be sealed in a safe and environmentally sound manner in accordance with R645-301-631, R645-301-738, and R645-301-765. Ownership of wells will be transferred only with prior approval of the Division. The conditions of such a transfer will comply with State and local laws. The permittee will remain responsible for the management of the wells until bond release in accordance with R645-301-529, R645-301-551, R645-301-631, R645-301-738, and R645-301-765.

731.500 Discharges

Discharges into an Underground Mine. No discharges of surface water will be made to an underground mine in the permit and adjacent areas.

Gravity Discharges from an Underground Mine. No gravity discharges will be made from an underground mine in the permit and adjacent areas.

731.600 Stream Buffer Zones

The surface facilities for the Dugout Canyon Mine will be constructed within 100 feet of Dugout Creek (a perennial stream, intermittent adjacent to mine facilities) and Pace Creek (an intermittent stream adjacent to fan facilities). However, surface runoff- and sediment-control facilities designed for the site (as discussed in subsequent sections of this chapter) will ensure that coal mining and reclamation operations will not cause or contribute to the violation of applicable Utah or federal water standards and will not adversely affect the water quantity and quality or other environmental resources of the stream.

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TABLE 7-4
Groundwater Monitoring Program
Field and Laboratory Measurement Protocol

<u>Monitoring Wells</u>	<u>Protocol</u>	<u>Comments</u>
GW-10-2	A, 1	Screened in Castlegate Sandstone
GW-11-2	A, 1, E	Screened in Price River Formation
GW-24-1	A, 1	Screened in Castlegate Sandstone
<u>Springs</u>		
SP-20 (S-30)	B, 2, 5	Flagstaff
SC-14	B, 2, 5	North Horn
SC-65	B, 2, 5, E	Colton
SC-100	B, 2, 5, E	Flagstaff (at North Horn FM. Contact)
SC-116	B, 3, 5, E	North Horn
200	B, 3, 5, D	North Horn
203	B, 3, 5, E	North Horn
227	B, 3, 5, D	Castlegate Sandstone
259	B, 3, 5, D	North Horn
259A	B, E	Colton
260	B, 3, 5	Colton
MD-1	C, 4	Gilson Seam Workings Discharge
321	B,6, E	Colton
322	B, D	Colton
324	B,6, E *	Colton

Protocols

- A Monitoring well: quarterly water level measurement only
- B Spring: quarterly flow measurements
- C Mine Water Discharge, abandoned Gilson Seam workings: quarterly flow measurements
- D Discontinued Monitoring after 1st Quarter 2012
- E Monitoring Discontinued see Section 731.200 for dates and additional information.

Water quality

- 1 Monitoring well: No quality measurements.
- 2 Spring: quarterly operational groundwater quality parameters for two years beginning 3rd quarter 1999 after which quarterly field measurements only.
- 3 Spring: quarterly baseline parameters for three years beginning 1st quarter 1999 after which quarterly field measurements only.
- 4 Mine water discharge: quarterly operational water quality parameters.
- 5 During wet or dry years (as described in the PHC, Appendix 7-3), flows will be taken weekly between April 1 and August 31 as conditions permit. Also during the first wet or dry year, one operational laboratory sample and one Tritium sample will be obtained at these sites during high and low flow season (requirement completed in 2011).
- 6 Spring: quarterly operational groundwater quality parameters for two years beginning 3rd quarter 2007 after which field measurements only. * At site 324 quarterly operation ground water quality parameters for two years beginning 3rd quarter of 2008, after which field measurements only.

Groundwater Quality Parameters

FIELD MEASUREMENTS

Water Level or Flow
pH
Specific Conductivity
Temperature

REPORTED AS

Feet or gpm or cfs
pH units
µs/cm @ 25°C
°C

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TABLE 7-4 (continued)
Groundwater Monitoring Program

Laboratory Parameters	Reported As	Operational Monitoring	Baseline Monitoring
Acidity	mg/l		X
Aluminum (Dissolved)	mg/l		X
Ammonia	mg/l		X
Arsenic (Dissolved)	mg/l		X
Boron (Dissolved)	mg/l		X
Bicarbonate	mg/l	X	X
Carbonate	mg/l	X	X
Calcium (Dissolved)	mg/l	X	X
Chloride	mg/l	X	X
Cadmium (Dissolved)	mg/l		X
Copper (Dissolved)	mg/l		X
Iron (Dissolved)	mg/l	X	X
Iron (Total)	mg/l	X	X
Lead (Dissolved)	mg/l		X
Magnesium (Dissolved)	mg/l	X	X
Manganese (Dissolved)	mg/l	X	X
Manganese (Total)	mg/l	X	X
Molybdenum (Dissolved)	mg/l		X
Oil and Grease	mg/l		
Potassium (Dissolved)	mg/l	X	X
Total Alkalinity	mg/l		X
Total Dissolved Solids	mg/l	X	X
Total Hardness (CaCO ₃)	mg/l		X
Total Suspended Solids	mg/l		
Selenium (Dissolved)	mg/l		X
Sodium (Dissolved)	mg/l	X	X
Sulfate	mg/l	X	X
Zinc (Dissolved)	mg/l		X
Anions	meq/l	X	X
Cations	meq/l	X	X

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TABLE 7-5
Surface Water Monitoring Program
Field and Laboratory Measurement Protocol

<u>Streams</u>	<u>Protocol</u>	<u>Comments</u>
DC-1	1	Located on Dugout Creek downstream of mine
DC-2	2	Located on Dugout Creek immediately upstream of mine on left-hand fork
DC-3	2	Located on Dugout Creek immediately upstream of mine on right-hand fork
DC-4	3	Located on Dugout Creek upstream of mine on west fork of left-hand fork
DC-5	3	Located on Dugout Creek upstream of mine on east fork of left-hand fork
PC-1a	2, 4**	Located on Pace Creek on the eastern edge of State Coal Lease ML 48435-OBA
PC-2	2	Located on Pace Creek on the western edge of State Coal Lease ML 48435-OBA
PC-3	1	Located on Pace Creek in Section 20, T13S R13E
RC-1	2, 4**	Located on Rock Creek on the southern edge of State Coal Lease ML 48435-OBA
FAN	1	Located on Pace Creek above fan facilities
323	1, 4	Located in SE1/4, SW1/4, SE1/4 of Section 8, Township T13S, R13E

Protocols

- 1 Stream: quarterly operational surface water quality measurements analyzed as per parameters listed below.
- 2 Stream: quarterly operational surface water quality measurements analyzed as per parameters listed below except during first wet or dry years when weekly flow will be obtained from April 1 through August 31, as conditions permit (requirement completed in 2011) , in addition to quarterly samples.
- 3 Stream: weekly flow measurements during first wet or dry year will be obtained from April 1 through August 31 as conditions permit. Also during the first wet or dry year, one operational laboratory sample and one tritium sample will be obtained at these sites during high and low flow season (requirement completed in 2011).
- 4 Discontinued Monitoring after 1st Quarter 2012 or ** 3rd Quarter 2019

Surface Water Quality Parameters

FIELD MEASUREMENTS

Flow
pH
Specific Conductivity
Dissolved Oxygen
Temperature

REPORTED AS

gpm or cfs
pH units
µs/cm @ 25°C
mg/l
°C

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**TABLE 7-5 (continued)
Surface Water Monitoring Program**

Laboratory Parameters	Reported As	Operational Monitoring	Baseline Monitoring
Acidity	mg/l		X
Aluminum (Dissolved)	mg/l		X
Ammonia	mg/l		X
Arsenic (Dissolved)	mg/l		X
Boron (Dissolved)	mg/l		X
Bicarbonate	mg/l	X	X
Carbonate	mg/l	X	X
Calcium (Dissolved)	mg/l	X	X
Chloride	mg/l	X	X
Cadmium (Dissolved)	mg/l		X
Copper (Dissolved)	mg/l		X
Iron (Dissolved)	mg/l	X	X
Iron (Total)	mg/l	X	X
Lead (Dissolved)	mg/l		X
Magnesium (Dissolved)	mg/l	X	X
Manganese (Dissolved)	mg/l	X	X
Manganese (Total)	mg/l	X	X
Molybdenum (Dissolved)	mg/l		X
Oil and Grease	mg/l	X*	X*
Potassium (Dissolved)	mg/l	X	X
Total Alkalinity	mg/l		X
Total Dissolved Solids	mg/l	X	X
Total Hardness (CaCO ₃)	mg/l		X
Total Suspended Solids	mg/l	X	X
Selenium (Dissolved)	mg/l		X
Sodium (Dissolved)	mg/l	X	X

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TABLE 7-5 (continued)
Surface Water Monitoring Program

Laboratory Parameters	Reported As	Operational Monitoring	Baseline Monitoring
Sulfate	mg/l	X	X
Zinc (Dissolved)	mg/l		X
Anions	meq/l	X	X
Cations	meq/l	X	X

* Not sampled at monitoring sites DC-4, DC-5, and RC-1. These sites are outside the area that could be influenced by mining related disturbance.

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APPENDIX 7-14

Water Monitoring Site Reduction

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INFORMATION ASSOCIATED WITH A REDUCTION IN WATER MONITORING AT SELECTED GROUNDWATER AND SURFACE WATER LOCATIONS

MINE HISTORY AND OPERATION

Dugout Canyon Mine was opened in 1998 when mining activities began in the Rock Canyon seam. Longwall mining moved from the Rock Canyon seam to the Gilson seam in February 2004.

In 2007, Dugout Canyon Mine (Dugout) prepared an addendum to their PHC in conjunction with expansion of the mine permit area to include approximately 600 acres in the northeastern portion of the permit area. Monitoring sites SC-65, SC-116, 203, 259A, 260, 321, 324 and PC1A proposed as part of the reduction are within the area covered by the addendum. The addendum includes updates to the surface and ground water monitoring plan, updated flow and water quality information for selected monitoring sites, additional monitoring sites, and the probable hydrologic impacts of mining to the added permit area. Portions of the addendum are included in this report prepared to reduce water monitoring sites. The PHC and the complete addendum are located within the M&RP in Appendix 7-3. The location of the monitoring locations is shown on Plate 7-1 of the M&RP. The sample locations are identified on PHC Update Figure 1 and tables listing the measured field parameters are listed in PHC Update Table 1 and included in Attachment 1. Laboratory analysis results for the selected water monitoring sites are included in Attachment 1. Graphs supporting the discussion regarding mining impacts to existing monitoring sites are included in Attachments 2, 3 and 4 included in Appendix 7-3.

Mining Techniques and Locations - The primary method of coal extraction employed longwall techniques supported by development mining using continuous mining equipment. Initial mining within the Rock Canyon seam began with typical two- or three-entry systems for the headgates and tailgates. However, difficulties in roof control and depth of cover forced the mine to develop longwall panels that were separated by thick coal barrier pillars. Improved roof control has been obtained by using the barrier pillar technique and subsidence over those panels separated by the barriers is notably less than those panels lacking the barrier pillars. In **2013**, the long wall was removed from the mine and only first mining is done using continuous mining equipment. Coal removed by this method does not generate subsidence. There are no plans to return a longwall to the Dugout Mine.

Water Management and Discharge to Dugout and Pace Creeks - Water is collected in the Dugout Mine from numerous roof drips, fractures and faults. The water is managed through a series of sumps that include flooded gob and abandoned workings. Between 1998 and September 2018, the discharge rate from the mine to Dugout Creek has increased from a few gallons per minute to a rate of about 1200 gpm, though recent discharges rates have occasionally been higher (1750 gpm) due to power failures and interception of additional ground water. Discharge to Pace Creek from the Pace Canyon Fan portals averages 350 but can be as much as 900 gpm. Both discharge rates vary according to the volume of intercepted water, holding capacities within the sumps and gobs, and power availability.

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It is anticipated mining will continue to occur in either the Rock Canyon or Gilson seams until 2026. Mining in the Dugout area should not affect the water quality of adjacent ground waters or springs since the ground water system in the mine layers is locally compartmentalized both vertically and horizontally.

ANALYSIS OF SURFACE AND GROUNDWATER SYSTEMS

Study Area - Sections 16, 17, 18, 19 and 21 of T13S R13E are the study area discussed in this report, only sites SC-100 and RC-1 to be removed from monitoring were not part of the addendum to the PHC. Portions of the drainage areas that intersect these sections have also been added to the study area (PHC Update Figure 1, Appendix 7-3). The study area includes portions of the headwaters of Pace and Dugout Canyons as well as a small portion of the headwaters of Cow Canyon, a tributary to Nine Mile Canyon.

Addendum Methods of Investigation - Methods in the original PHC investigation were employed in the addendum report as well to determine possible hydrologic consequences due to mining. Also, measured flow and selected chemistry parameters were reviewed for existing Dugout Mine monitoring sites to determine what, if any, impacts have occurred to surface and ground water resources. Baseline field data were collected from surface and ground water sites (PHC Addendum, Appendix 7-3).

HYDROLOGY

Dugout is located within the Price River Drainage. It currently operates within the Dugout Canyon, Pace Creek, Fish Creek, and Pine Creek drainages that are tributary to the Price River drainage. The mine also operates within small portions of the Cow Canyon tributary to Nine Mile Canyon. Both the Price River and Nine Mile drainages are tributary to the Green River.

The general description of the function and water chemistry of the ephemeral, intermittent, and perennial streams in Section 2.7.2 of the original PHC (M&RP, Appendix 7-3) describes the conditions within the existing permit area. While expansion of the permit area in 2007 undermined a small portion of Cow Canyon, the mining and related minor amounts of subsidence will not occur under or near perennial streams. The segments of drainages that will be undermined in Cow Canyon are ephemeral in nature. Ground water samples have been obtained from a few springs within the Cow Canyon drainage and are described in Section 731.200 of M&RP, Appendix 7-14 and Addendum to PHC in Appendix 7-3.

Refer to Section 2.8 of the original PHC for a discussion of hydrogeology and the Chemical evolution of ground waters (M&RP, Appendix 7-3).

Geologic Structure- Bedrock in the Dugout Canyon Mine generally dips to the north-northeast at an average of 8 degrees. Normal faults do occur in the mine area but typically have throws measured in feet and not tens of feet. Most faults encountered underground have little to no obvious surface expression. A few faults encountered underground have produced water from the floor and roof. Typically, the flow from the roof will diminish significantly over a short period of time while flow from the floor will also diminish but may persist for several months or even years.

Fractures are also encountered during the mining process and some can produce water similar to the faults. The majority of both the fault and fracture systems trend northwest to southeast.

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A few fractures and faults trend east west in the Pace Canyon area. The geologic setting of the Dugout Canyon Mine is discussed in some detail in Chapter 6 of the M&RP.

Description of Surface Water Systems

Monitoring of springs and surface waters in the Dugout Canyon Mine area since 1998 has indicated there is no hydraulic connection between the mine and surface waters. Also, except for increasing the baseflow in Dugout and Pace Creeks, the effects of coal mining in the Dugout Canyon Mine within the Blackhawk Formation on overlying springs and surface water is and should continue to be negligible.

There are two creeks where monitoring is proposed for elimination RC-1 (Rock Creek) and PC1A (Pace Creek), both monitoring sites are outside the mine's potential for impact. Refer to graphs in this report for flow history 2009 thru 2018, additional graphs depicting flow are located in Appendix 7-3.

Pace Creek - Site PC-1A is located on Pace Creek upstream of mining activity and at the eastern permit boundary. Mining has not occurred upstream of or beneath site PC-1A. Flows in Pace Creek have monitored on a quarterly basis at PC-1A since September 1999. Flows in Pace Creek currently appear to be controlled by the cycles of wet and drought, with an occasional storm event having elevated flows from the average flow of 14 to between 40 and 80 gpm.

Rock Creek - RC-1 is located downstream of any planned mining activities and near the southeastern boundary of the permit area (Plate 7.1 of the MRP). The creek seldom contains water, with flows only seen in the creek bed during significant snow melt runoff or after heavy precipitation events as illustrated by the single sample taken May 24, 2011. No portion of the creek was subsided.

Description of Ground Water Systems

The physical characteristics of the spring locations and the flow volumes discharging from the springs associated with the Dugout Mine area are described below. Since most of the monitored springs are currently located outside of the mining area, flow rates were chosen to be the parameter that would most likely be impacted by mining activities. The general water chemistry of the monitored springs has not significantly changed since monitoring began. Graphs of the flow associated with springs SC-65, SC-116, 203, 259A, 260, 321, 324 and SC-100 are included with this report.

Colton Ground Water System

The Colton Formation forms the plateau within the area. Springs SC-65 and 260 are springs proposed for removal from the water monitoring plan. Figures contained in Attachment 2 of PHC and Appendix 7-14 illustrate the history of the flow monitored at the springs. Spring SC-65 has been monitored since October 1995 while Spring 260 has been monitored since June 2000. Both springs and their recharge areas are outside the areas that have been undermined by Dugout. Both springs demonstrate seasonal flows.

At **Spring SC-65**, June of 2011 brought the highest flow at this spring with a flow of 48 gpm, the flow was reduced to 25 gpm by October of 2011, with the flow reduced to approximately 2 gpm in June of 2012. Historically the variability of the flow from SC-65 appears to follow the pattern

of drought and wet cycles as illustrated on the Palmer Hydrologic Drought Index (PHC, Attachment 2).

For **Spring 260**, the spring's recharge area is more than 2000 feet above the projected mine workings. Any interruption of flow would likely be temporary as the subsidence created low areas within the aquifer itself filled with recharge. Because of the fine-grained nature of the bedrock units, diversion of water from the aquifer into underlying bedrock units is unlikely.

Spring 260 lies over an underground mine entry (first mining) with an unmined coal pillar of approximately 670' in width between the spring and the closest mined longwall panels to the south. Flow from Spring 260 somewhat follows the cycle of drought and wet but not quite as clearly as SC-65. Flow data does not indicate an impact to the spring or its recharge area.

Colton springs 321 and 324 were added in 2007 to the water monitoring plan for Dugout. Springs 321 and 324 are located outside the mine's leased area, therefore they will not be mined. Graphs of these flows are contained in the PHC, Attachment 2 and this report.

Spring 321 is located in a small tributary to Cow Canyon. Flow measurements began in May 2007 followed by measurements in June, July, August, and October. Measured flows appear to drop from a high following spring runoff to baseline conditions by August. Some development work has been performed at the spring. Spring 321 individually flows a few gallons per minute, but the area has several springs, the flow recorded in June 2017 is a collection of spring and surface runoff, not 321 individually.

Groundwater monitoring location **324** is associated with existing water right identified by an authorized representative of the Conover Trust. Spring 324 has been monitored for 10+ years. The spring is in a small tributary to Cow Canyon. Site 324 lies outside the area under lease for mining, thus excluding the influence by mining operations. The flow recorded on June 2011, has been corrected from 29 gpm to 2.9 gpm in the report graph and is considered a typographical error in the DOGM database.

Flagstaff Ground Water Systems

The Flagstaff Formation thins to the east and eventually pinches out near the eastern portion of the mine permit area. Currently, the mine monitors spring SC-100 in the Flagstaff Formation. Spring **SC-100** has been monitored since 1995 to the present. Spring SC-100 is located upstream of the mine operations in the Dugout Creek drainage and issues from the side of a stream bank near the bottom of the channel. According to water monitoring personnel, flows monitored between 1997 and 2002 may have included portions of the adjacent creek. Changes in the stream channel and spring discharge have allowed the flow of the spring to be monitored separately from the stream flow. The spring is located at least three fourths of a mile north of the current mine workings and has not been subsided nor likely has its recharge area.

North Horn Ground Water Systems

Dugout currently monitors springs discharging from the North Horn ground water system. Graphs illustrating the flow of SC-116, SC-203, and spring 259A are in Attachment 2, PHC and this report.

Spring SC-116 flow was first monitored in October 1995 with regular monitoring initiated in November 1998. This spring is located in a tributary to Pace Creek and overlies a longwall

panel Dugout mined in 2008. Between June 2001 and November 2004, flow volumes were less than 2 gpm. Through the wetter cycle of 2005, flows increased. Then in the drier period of 2006, the flows once again diminished. Beginning in 2006 thru 2007 prior to undermining the spring the average flow was 1.37 gpm; 2007 thru 2008 the average flow was 3.25 gpm. From 2007 to 2018 the flow fluctuated with the average flow being approximately 3 gpm. Historical flows indicate ground water discharge volume from the spring is related to cycles of drought. Refer to graphs in Appendix 7-3 and this report for variations in the flow.

Spring SC-203 is located in Pace Canyon and is outside the area that is planned for mining. It is a developed spring discharging through a pipeline into a stock tank used by livestock and wildlife. The flow graph of the spring illustrates flows typically between 2.5 and 5 gpm with occasional flows slightly less or greater. Flow was measured in the spring of 2003 at more than 20 gpm but that rate appears to be anomalous to other recorded flows. The spring's flow does not appear to typically be impacted by climatic changes.

A new monitoring point, **259A**, was added to the monitoring program in July of 2007. This spring has been developed by the landowner for livestock watering, discharging from a pipeline into a stock tank. Discharge rates obtained in 2006 indicate the flow in early spring was about 1 gpm, decreasing in the Fall to approximately $\frac{1}{4}$ gpm. In the 2007, the spring flows gradually decreased through the summer and by September, the flow essentially ceased. The flow recorded into the DOGM database for June of 2011 is most likely an error and should be 1 gpm not 10 gpm. This spring and its recharge area have not been mined or subsided.

PROBABLE HYDROLOGIC CONSEQUENCES

Coal mining has the potential to impact the hydrologic balance by decreasing creek flows and spring discharges by capturing surface or other ground waters from these sources as a result of mine related subsidence, bedrock fracturing, and aquifer dewatering. However only, Spring SC-116 has the potential of being affected by subsidence caused by undermining of the spring. The potential exists that flow from a spring may be decreased for a short period of time or their discharge points moved. Flows in monitored springs in the drainages associated with Dugout Mine do not appear to have been measurably decreased by mining activities.

Springs SC-65, 203, 259A, 260, 321, 324 and surface water site RC and PC1A are outside the area of mining influence.

The springs within the Pace Canyon drainage generally discharge from the North Horn, Flagstaff or Colton Formation. The depth of cover between the spring discharge locations and their recharge area and the mine workings themselves exceed at least 1000 feet. Subsidence fracturing associated with mining at these depths does occur at the surface. Typically, surface cracks only extend a few tens of feet into the bedrock before attenuating. Below that depth, the bedrock will typically react more plastically and bend, rather than break, as the ground over the mine longwall panels subside. The North Horn, Flagstaff, and Colton Formations contain significant beds of fine-grained material, such as shale, siltstone, and claystone that will tend to heal if fractured. This healing process would likely stop or restrict rapid downward migration of water either from the surface or from aquifers.

Several springs discharge from the Colton Formation north and east of the current permit area within the Cow Canyon drainage. Discharges of this flow show a strong relationship to seasonal variations in precipitation. The springs in the Cow Canyon drainages appear to be stratigraphically controlled. That is, they appear to discharge at the down dip end of an exposed

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stratigraphic unit within the Colton Formation. Because the Colton Formation contains interbedded sandstones, siltstones, and shales, it is likely these springs discharge at the base of a sandstone overlying a less permeable unit such as shale or siltstone. There is also a potential for some of the springs to be both stratigraphically and structurally controlled. In other words, the springs discharge from a fracture within a permeable layer overlying a less permeable layer. Unfortunately, the thick soil mantle in the area precludes observation of structure near the discharge location.

CONCLUSIONS

In 2013, the long wall was removed from the mine and only first mining is being done using continuous mining equipment. Spring SC-116 and 260 have been mined beneath, the other springs (SC-65, 100, 203, 259A, 321, 324) are outside the area of influence by mining. Surface water sites PC1-A and RC-1 are also outside the area of mining influence.

Sufficient monitoring information has been collected for the springs (SC-65, 203, 259A, 260, 321, 324, SC-116) and surface water (PC -1A, RC-1) locations to support that there is not apparent impacts associated with them. Refer to graphs and table included in this report and the Addendum to PHC, in Appendix 7-3.

Sites SC-65, 203, 259A, 321, 324, PC-1A, and RC-1 are outside the area of mining influence, with no mining occurring beneath or immediately adjacent to the monitoring sites. Spring SC-116 was mined beneath, but data supports that there was insignificant, or no impacts exhibited from mining/subsidence. Spring 260 lies over an underground mine entry (first mining). No impact was anticipated, and the monitoring data indicates no impact to the spring or it's recharge area.

Per the attached table and the Division's water database it can be verified that the monitoring sites to be eliminate from the monitoring program have been monitored at a minimum eleven years and a maximum of twenty-four years, with both surface water monitoring sites being monitored for twenty years. No impacts have been noted for the ten sites proposed from elimination and it is not anticipated that continued monitoring of the sites would indicate otherwise. Sufficient time has passed to verify that spring SC-116 and 260 have not been impacted and continued monitoring would not provide a different conclusion.

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WATER INFORMATION TABLE - MONITORING SITE REDUCTION 2019

Dugout Canyon Mine

Appendix 7-14

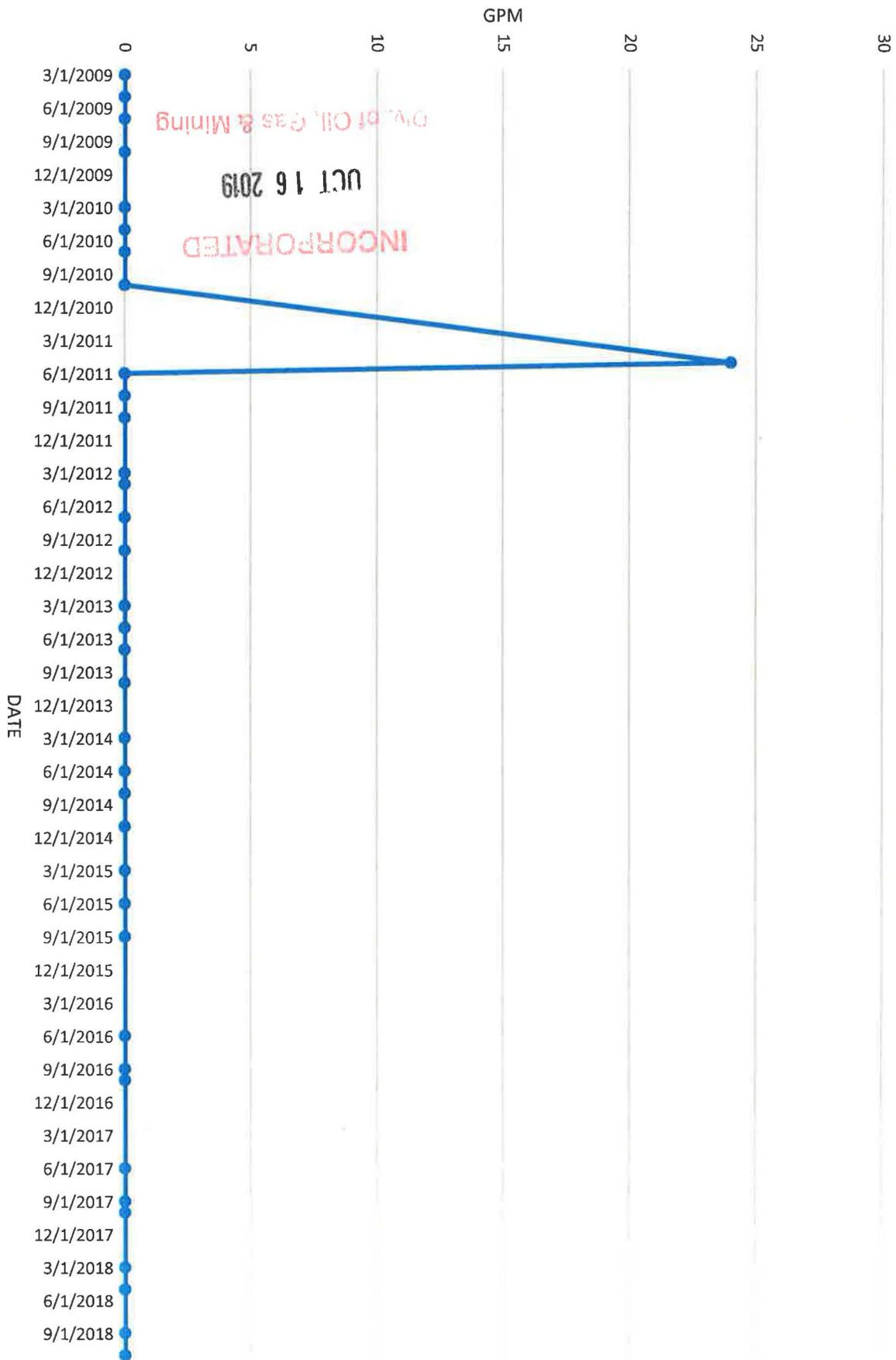
Groundwater Site Name	Drainage	Location	Flow						pH		Conductivity		Iron (total)		Manganese (total)		TDS		TSS		Stratigraphic Unit	Mining		Water Right	
			Maximum (gpm) [Year]&	Average (gpm)&	No. Samples*	Years Sampled (No. Years)&	No Flows Samples &	May 2019 (gpm)	Average &	May 2019	Average &	May 2019	Average &	May 2019	Average &	May 2019	Average &	May 2019	Average &	May 2019		Date Completed	Years Elapsed Since	Owner	Number (Quantity)
SC-65	Dugout Canyon	T13S R13E Sec 18	48 [2011]	4.3	88	1995 - 2019 (24)	8	51.5**	7.88	7.55	705	610	1.08	NA	0.05	NA	401	NA	NA	NA	Colton	NA	NA	NA	NA
SC-100	Dugout Canyon	T13S R12E Sec 12	18 [2011]	1.14	75	1995 - 2019 (24)	45	21	7.97	8.18	650	705	0.92	NA	0.04	NA	358	NA	NA	NA	Flagstaff	NA	NA	NA	NA
SC-116	Pace Canyon	T13S R13E Sec 19	8 [2005]	1.92	80	1995 - 2019 (24)	1	4.5	7.89	8.03	823	633	0.36	NA	0.02	NA	468	NA	NA	NA	North Horn	2008-2009	10	NA	NA
203	Pace Canyon	T13S R13E Sec 21	22 [2003]	3.55	76	1999 - 2019 (20)		2.5	7.61	7.51	1019	1002	0.04	NA	0.01	NA	711	NA	NA	NA	North Horn	NA	NA	George M Thayn	91-4970 (0.009 cfs)
259A	Pace Canyon	T13S R13E Sec 16	10 [2008]	1.12	35	2007 - 2019 (12)	14	NOA	7.43	NA	550	NA	0.03	NA	0.01	NA	344	NA	NA	NA	North Horn	NA	NA	NA	NA
260	Cow Canyon	T13S R13E Sec 17	33 [2003]	12.23	75	2000 - 2019 (19)		NOA	7.87	NA	530	NA	0.14	NA	0.02	NA	300	NA	NA	NA	Colton	2009-2010~	9	NA	NA
321	Cow Canyon	T13S R13E Sec 18	9.9 [2008]	1.4	37	2007 - 2019 (12)	6	NOA	7.74	NA	573	NA	1.21	NA	0.07	NA	321	NA	NA	NA	Colton	NA	NA	NA	NA
324	Cow Canyon	T13S R13E Sec 17	29 [2011]	2.49	29	2008 - 2019 (11)		NOA	7.87	NA	481	NA	1.9	NA	0.09	NA	275	NA	NA	NA	Colton	NA	NA	Clyde Conover	90-797 (0.25 cfs)

Surface Water Site Name	Drainage	Location	Flow (gpm)						pH		Conductivity		Iron (total)		Manganese (total)		TDS		TSS		Stratigraphic Unit	Mining		Water Right	
			Maximum (gpm) [Year]&	Average (gpm)&	No. Samples*	Years Sampled (No. Years)&	No Flows Samples &	May 2019	Average &	May 2019	Average &	May 2019	Average &	May 2019	Average &	May 2019	Average &	May 2019	Average &	May 2019		Date Completed	Years Elapsed Since	Owner	No. (Quantity)
PC-1A	Pace Creek	T13S R13E Sec 21	115 (2005)	14.5	79	1999 - 2019 (20)	1	75	8.3	8.36	788	8.01	1.3	0.23	0.3	0.024	483	443	53	9	NA	NA	NA	NA	NA
RC-1	Rock Creek	T13S R13E Sec 29	110 (2005)	2.9	77	1999 - 2019 (20)	70	NOF	8.17	NOF	1173	NOF	29.64	NOF	0.75	NOF	813	NOF	2336	NOF	NA	NA	NA	NA	NA

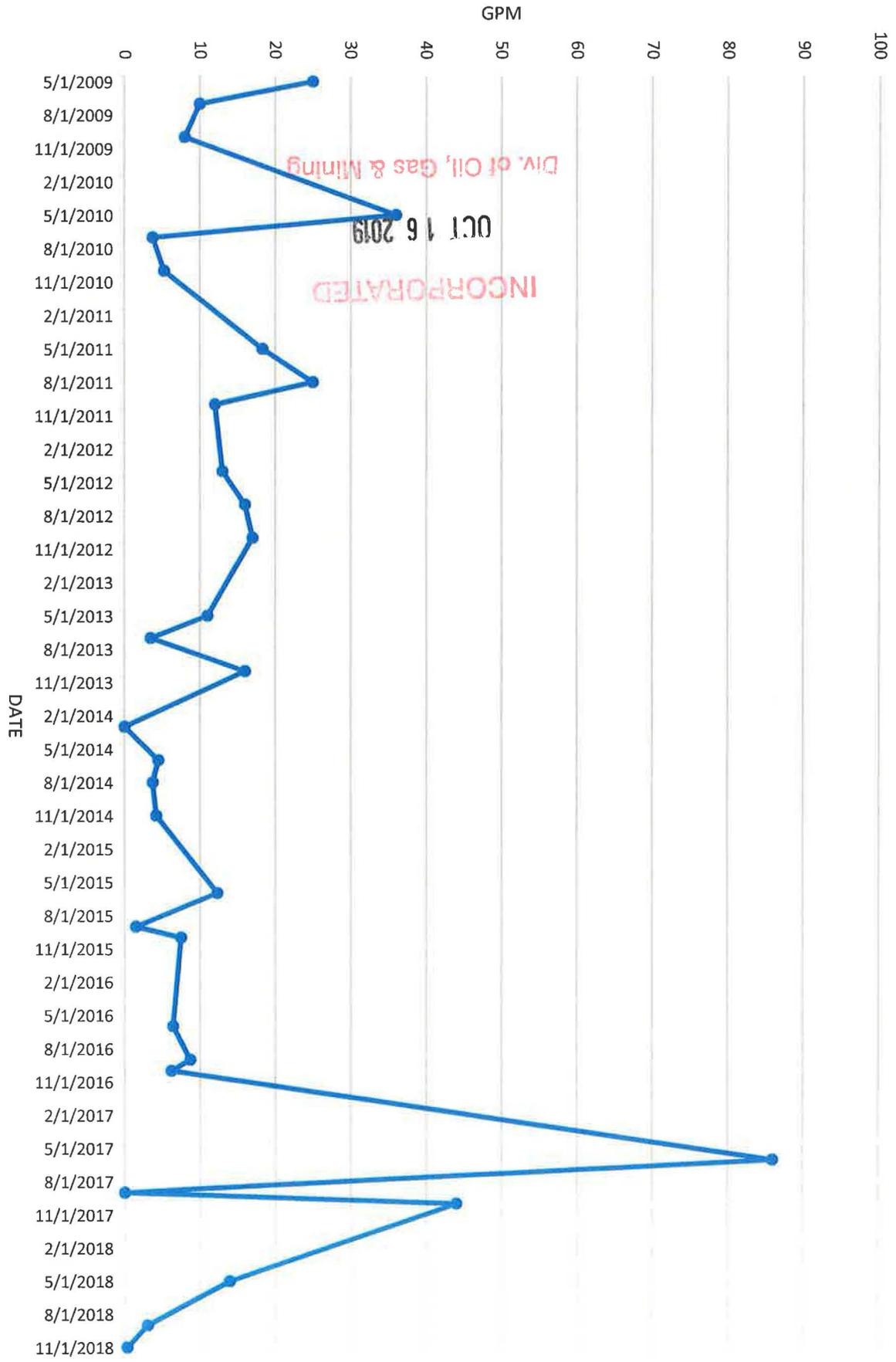
* Number does not include "no access" to site attempts
 ** Total of Immediate Area
 ~ No subsidence, Entry only
 & UDOGM Water Database

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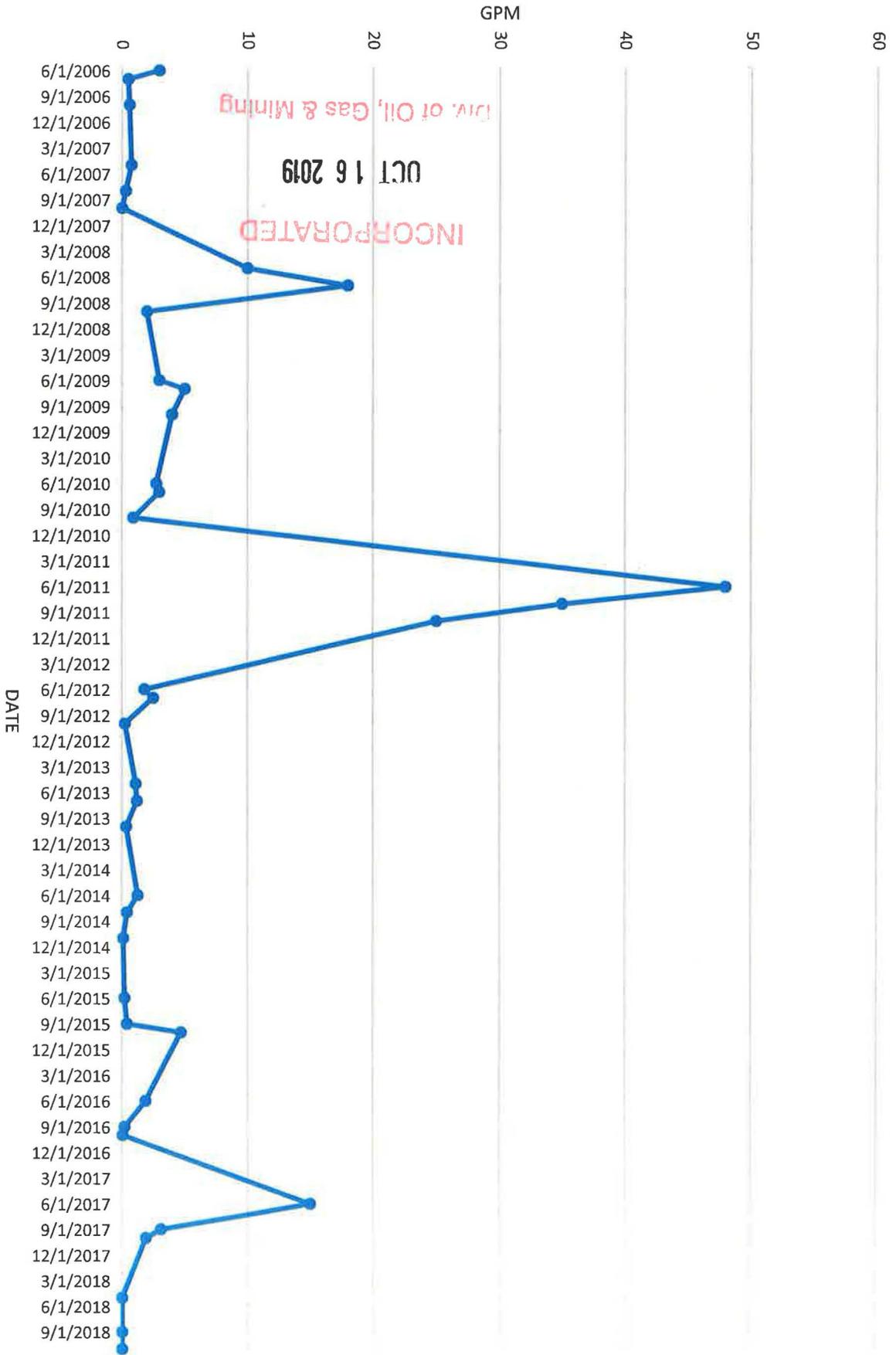
Rock Creek Drainage
Stream RC-1



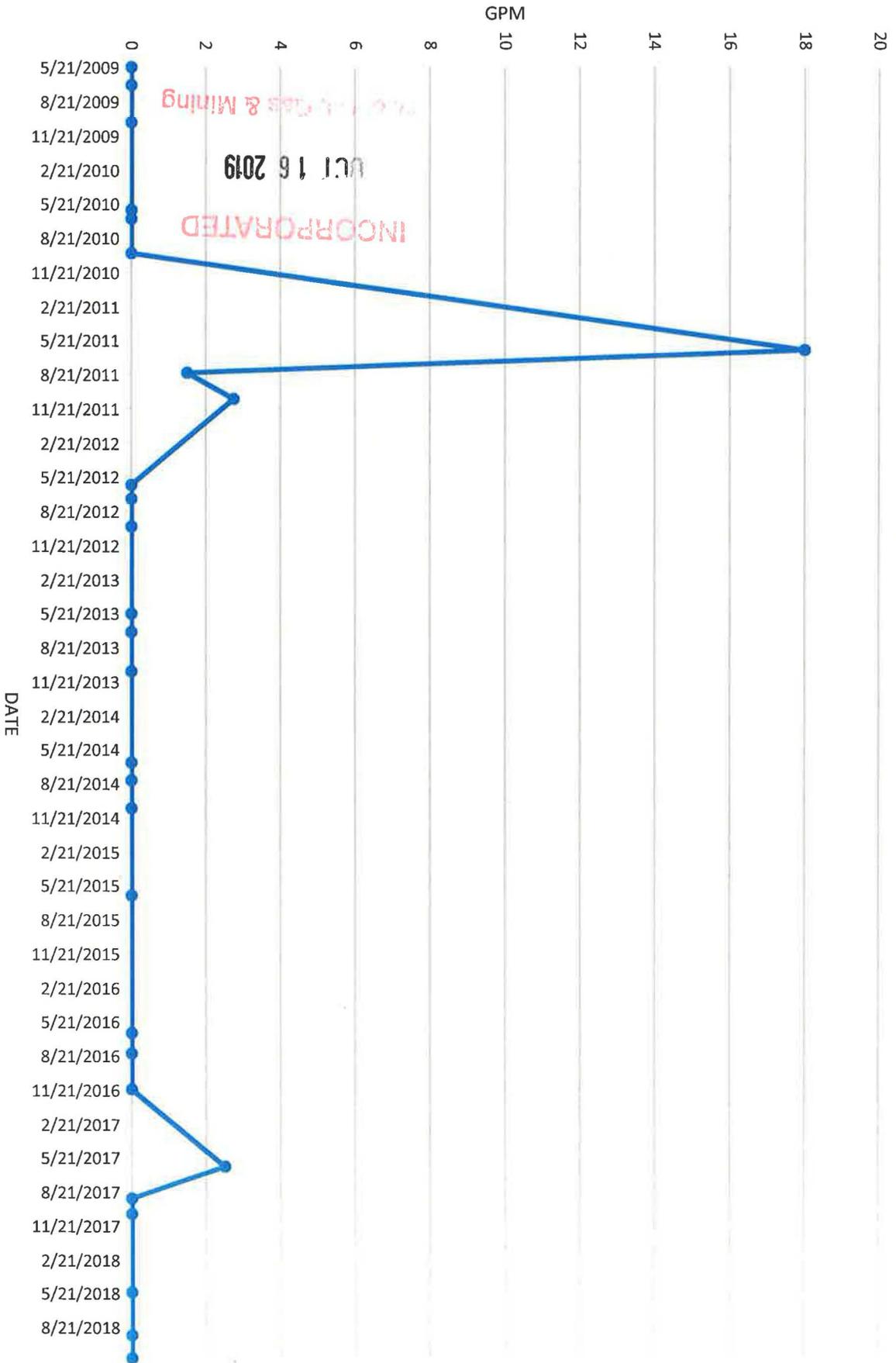
Pace Creek Drainage
Stream PC-1A



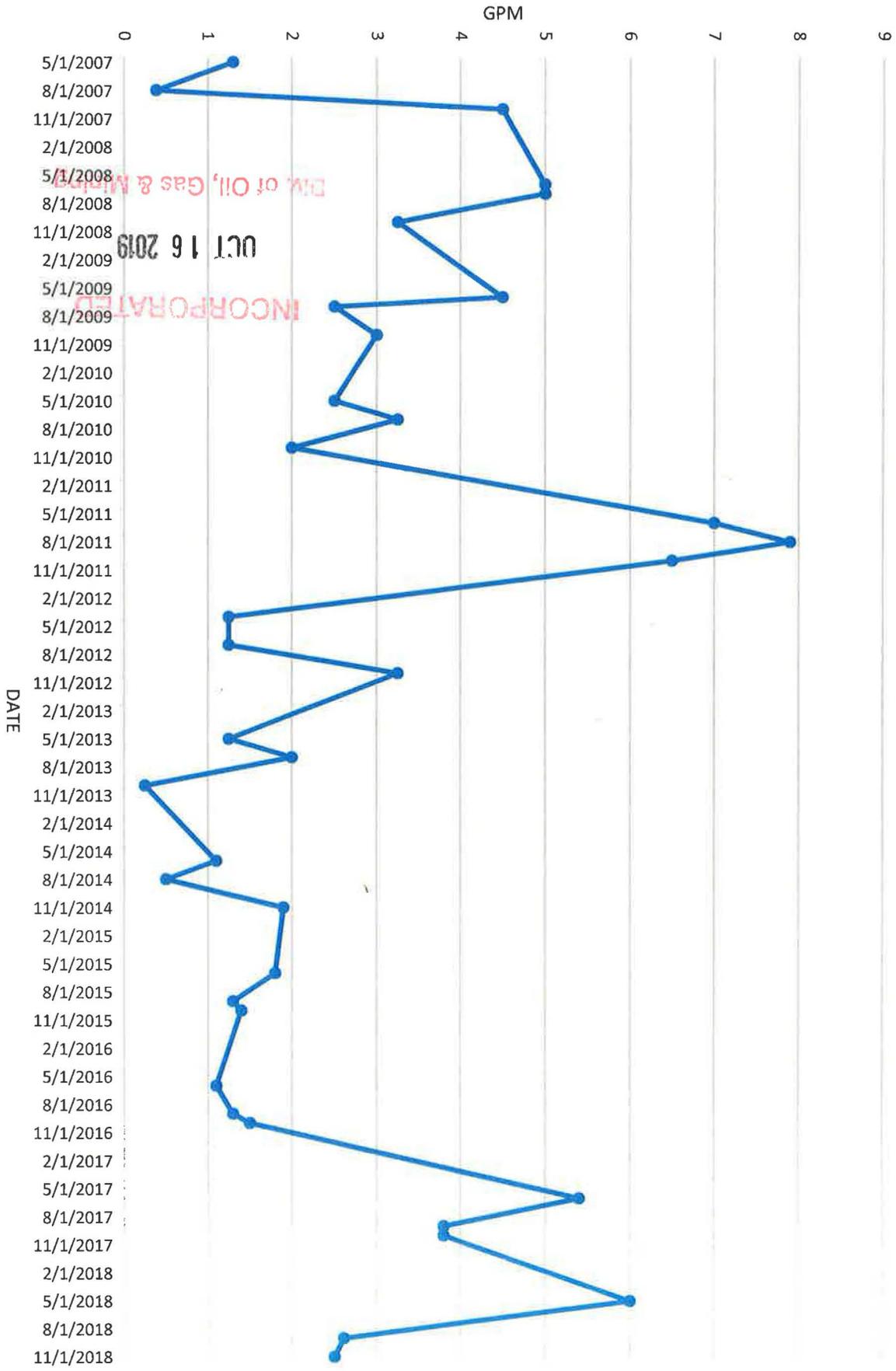
Dugout Canyon Drainage
Spring SC-65



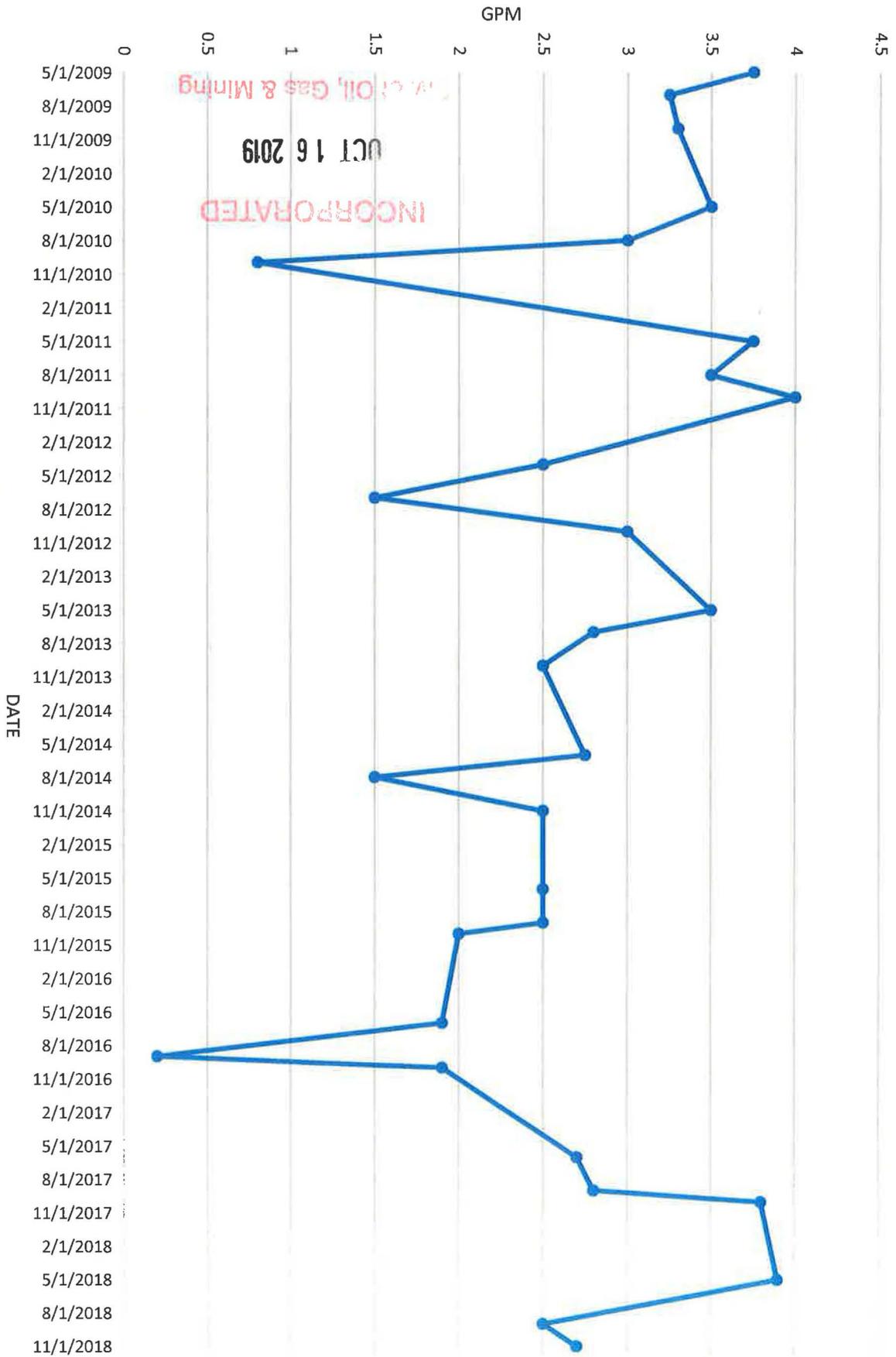
Dugout Canyon Drainage
Spring SC-100



Pace Canyon Drainage
Spring SC-116

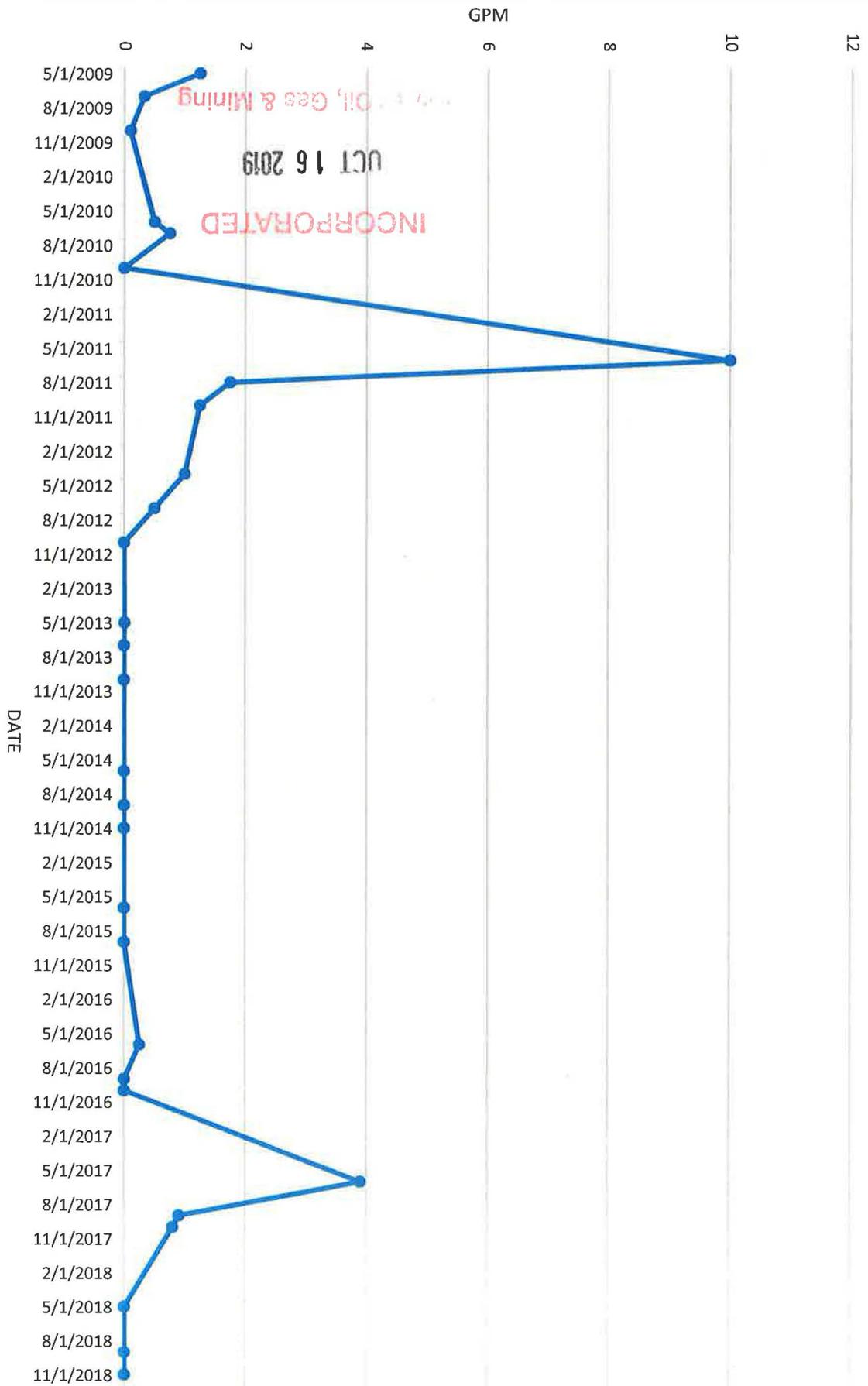


Pace Canyon Drainage
Spring 203

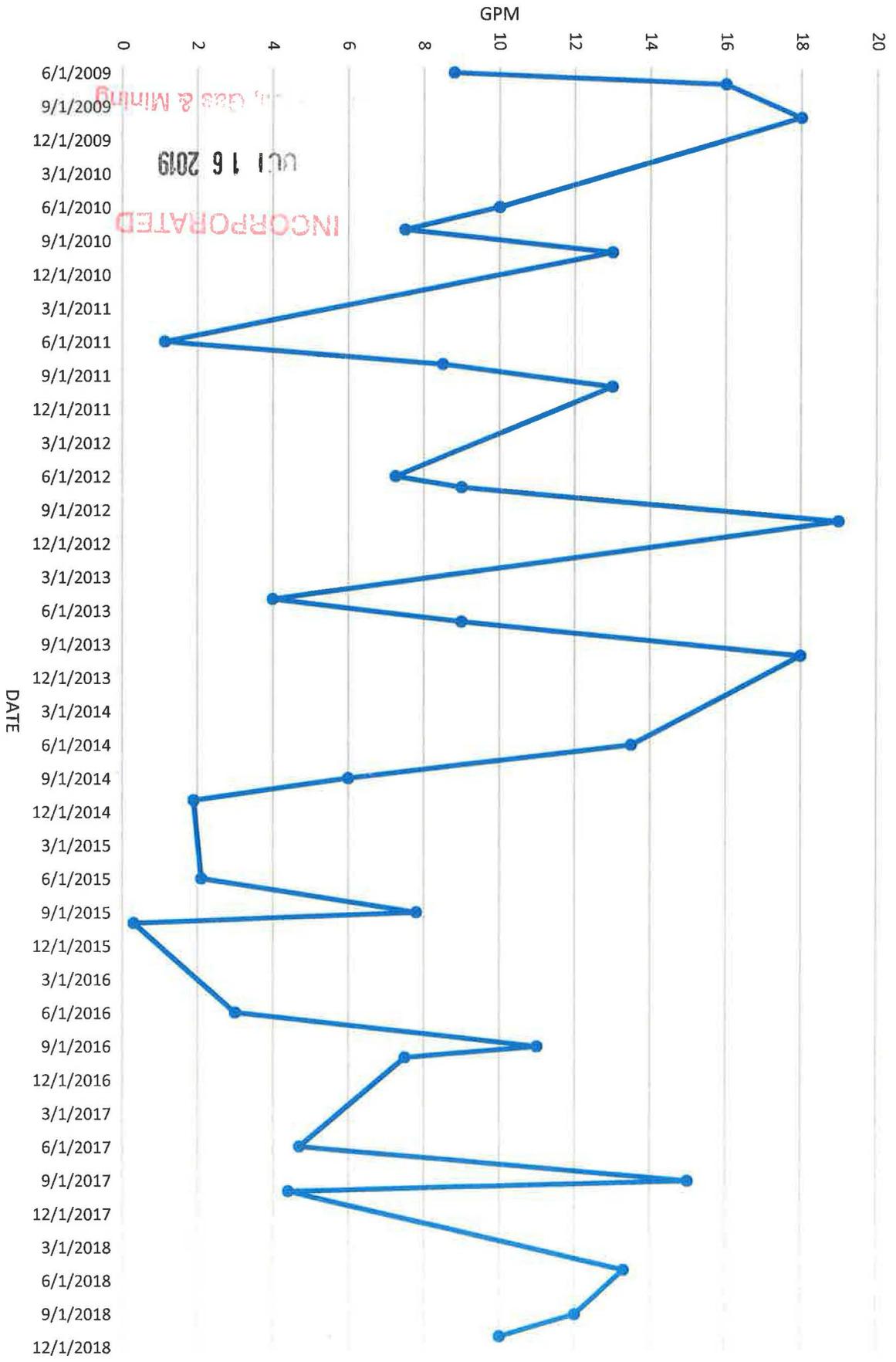


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Pace Canyon Drainage
Spring 259A

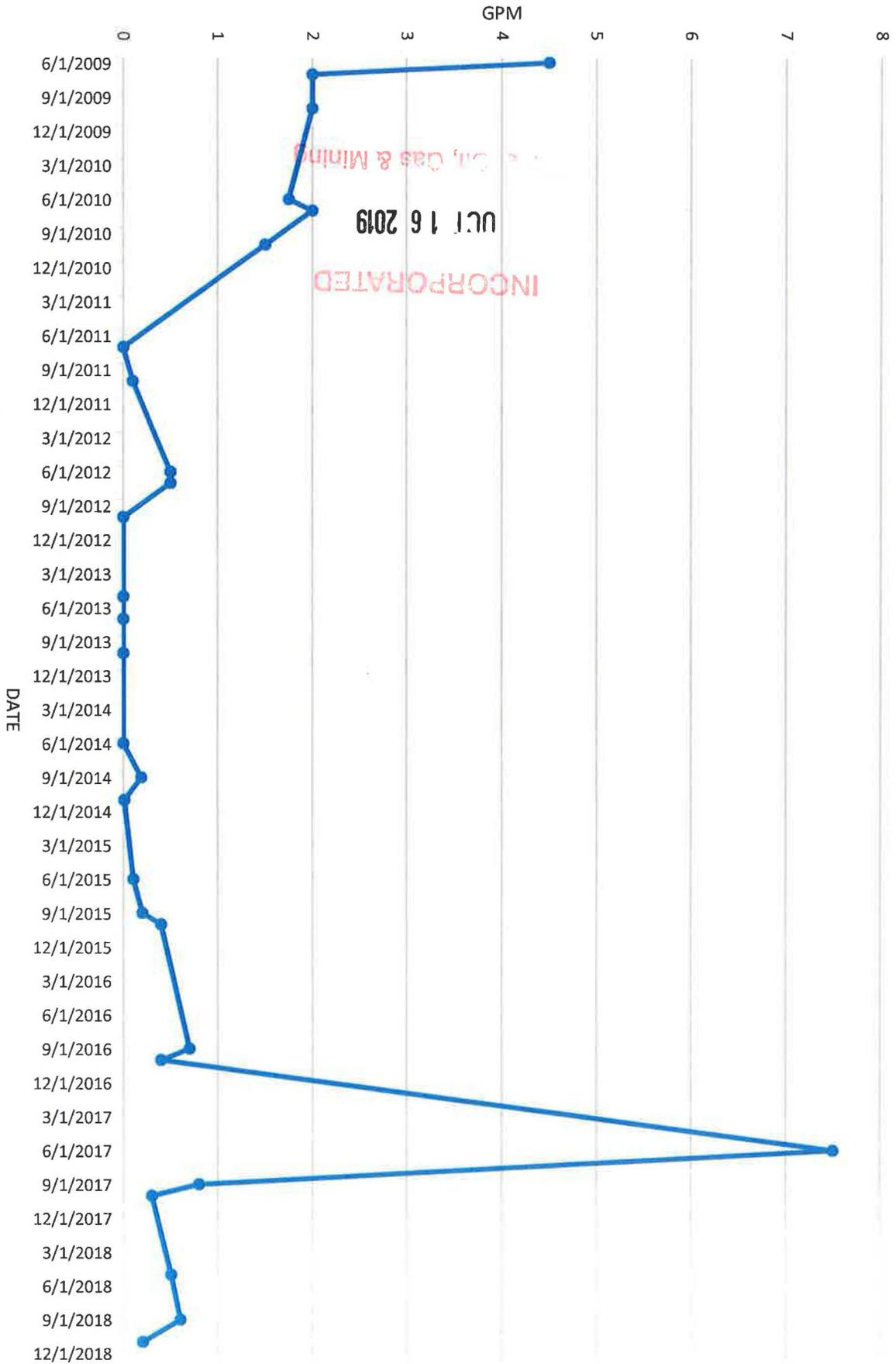


Cow Canyon Drainage
Spring 260

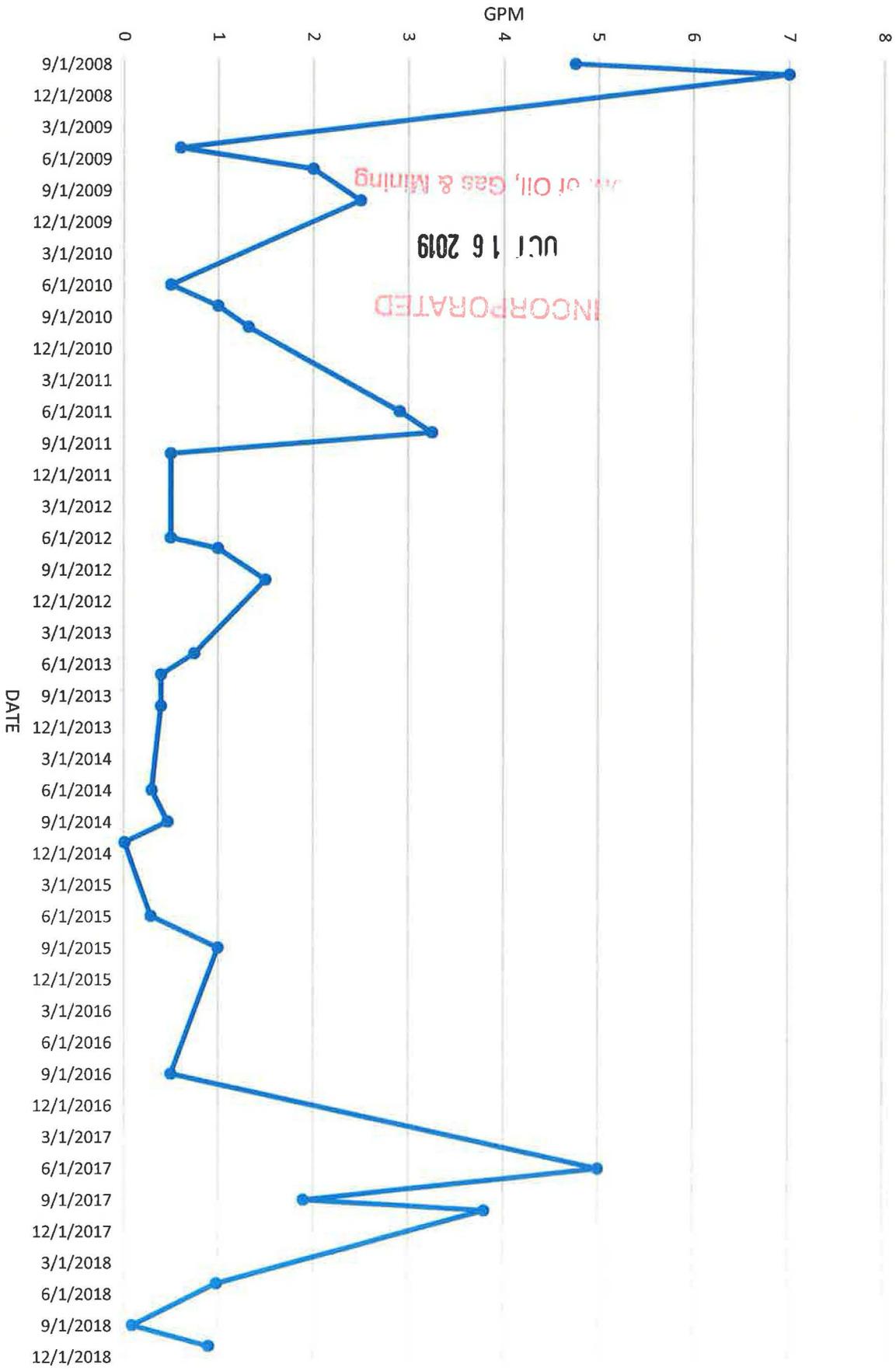


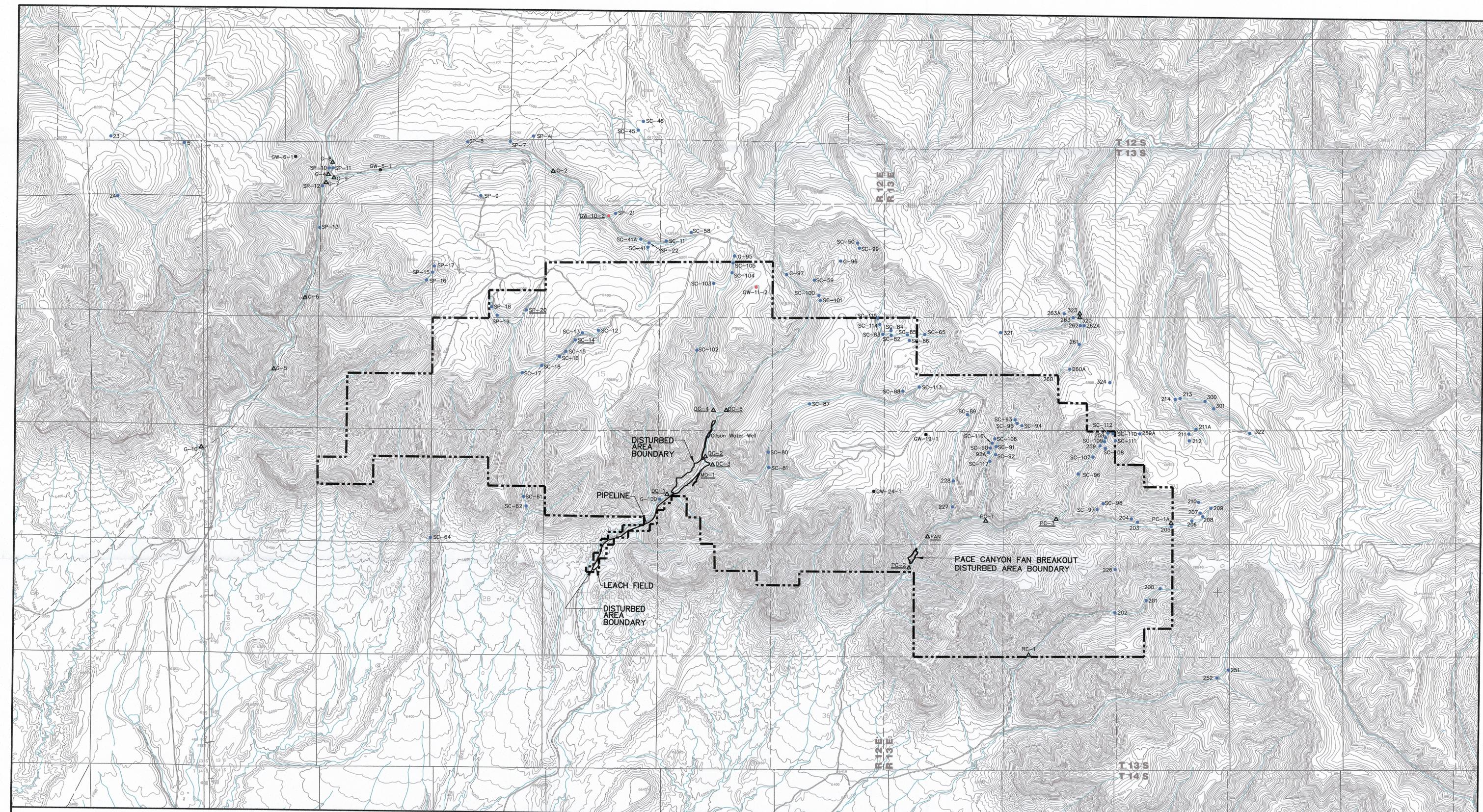
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Cow Canyon Drainage
Spring 321



Cow Canyon Drainage
Spring 324





LEGEND

- PERMIT AREA BOUNDARY
- MINE DISCHARGE
- SPRING
- MONITORING WELL
- △ STREAM STATION
- WATER WELL
- EXISTING DRAINAGE
- SC-65 UNDERLINED STATION NUMBERS INDICATE LOCATIONS FOR OPERATIONAL BASELINE AND POST-MINING MONITORING.
- CIRCLED STATION NUMBERS INDICATE LOCATIONS FOR BASELINE AND OPERATIONAL MONITORING FOR THE SITLA LEASE AREA.

NOTE:
 1. REFER TO REFUSE PILE AMENDMENT AND METHANE DEGASSIFICATION AMENDMENT FOR INFORMATION PERTAINING TO THEIR AREAS.



REVISION	
DATE	BY
09/18/07	SC
10/10/07	JLP
02/21/08	VSM/SWF
04/09/08	VSM/SWF
07/01/08	VSM/SWF
09/11/08	VSM/SWF
03/06/12	JKS
04/25/12	JKS
02/11/16	BK
07/06/16	BK/JKS
07/22/16	JKS
07/25/16	JKS
08/20/19	JKS

Canyon Fuel Company, LLC
 Soldier Canyon & Dugout Canyon Mines

HYDROLOGIC MONITORING STATIONS

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Dugout Canyon Mine

DRAWN BY: SWF DATE: 01/03/05 SCALE: 1" = 2000'
 APPROVED BY: LDJ FILE NAME: PLATE 7-1.DWG DRAWING OR MAP NUMBER: **PLATE 7-1**